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NASA'S DISSEMINATION OF TECHNOLOGY

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Mr. Mogavero is the Director of NASA's Technology Utilization Office where he is responsible for the transfer of NASA's aerospace technology to nonaerospace uses. Prior to joining NASA, Mr. Mogavero owned an aluminum specialty company, then worked in aerospace production control and engineering. He also spent ten years developing new products for the Boeing Company.

When I first began to think about how I would describe NASA's Technology Utilization Program, it seemed to me that what was missing was the reason we have such a program, that is to say, what are we trying to accomplish? And equally important, I should say a few words about the effectiveness of our program, the things we have accomplished and the lessons we have learned from both our successes and failures. Let me begin by describing how the program got started.

The NASA aerospace transfer process began as an experiment. This experiment was initiated by the law that created the National Aeronautics and Space Administration in 1958 with a specific provision directing NASA to provide "for the widest practicable and appropriate dissemination of information concerning its activities and results thereof." From this directive a very important question evolved. "Could technology developed for one purpose be successfully applied to other applications?" Put another way, "Could aerospace technology provide solutions to non-aerospace problems?"

If this experiment proved to be successful, then the return to the economy and to the taxpayers whose investment supported NASA's missions would be pure profit. Assuming that the research and development costs supported NASA's primary space and aeronautics missions, then any secondary use of this technology for other non-aerospace purposes would provide an additional benefit to our national economy.

Well, today after approximately 14 years of experience with this program, we can hardly continue to call it an experiment. It's a firmly established program that is alive, growing and constantly changing to meet new demanding challenges. The exciting thing about this program is that the exploration of space and the advancement of aeronautics generates innovations in almost every field of science and technology and, therefore, provides us with the broadest possible technical base to stimulate progress in areas not even remotely connected to the original research. Spinoffs of technology have ranged from medical devices for the handicapped to patching materials for street maintenance and countless applications in between.

It's easy to see why this experiment prospered. The technology was there in almost every field imaginable and the problems were there in both government and private industry. All that was needed was some kind of dedicated effort to bring the two together. The connector in this case is NASA's Technology Utilization Program.

First let me describe this program in broad, general terms before I give you some examples of actual transfers. The program is divided into three major activities, each structured to reach a specific group of people in order to let them know, first, technology exists that may be of value to them and, second, it is available.

Our technology data base consists of 1,300,000 items and is growing at a rate of 70,000 items per year. As new innovations are developed they are screened to identify those which may have some potential for non-aerospace applications. Each innovation is described in a one page "Tech Brief," which is sent to people who have asked for information either for their own personal use or for subsequent publication in various technical magazines and journals.

This type of dissemination is understandably broad in nature and is somewhat analogous to seeding the land. You are sure some seeds will take hold, but you never are sure where. So we decided to focus our efforts on the industrial sector for the obvious reason that industry is the most active user of technology. To accomplish this we established a national network of dissemination centers to serve industry by searching what has become the world's largest data bank of technical information. The network of centers includes the University of Connecticut, Research Triangle Park in North Carolina, University of Pittsburgh, Indiana University, University of New Mexico and the University of Southern California. The network has access to more than eight million documents and is growing at a rate of 50,000 documents each month. It contains about 800,000 space-related reports as well as ten times that many documents from private and non-governmental sources. The *range* of information covers air pollution, chemicals, education, engineering, nuclear energy, food, textiles, metallurgy, medicine, business, and economics.

You can see, there is a pretty good chance the network can locate information that can be of value to the people looking for solutions to their problems. Several thousand companies now use this service annually. I think it's important to mention that we understand the competitive environment we are working in and, therefore, throughout our negotiations the proprietary interests of the user are scrupulously protected. Technical information that has been provided through this network has resulted in many useful applications and new products. I'll mention some examples a little later.

One special center in this network, called "COSMIC", is located at the University of Georgia. I should spend a few moments to describe this center because its activities are very closely related to CAM-I's. COSMIC stands for Computer Software Management Information Center, and it contains one of the nation's largest software libraries of engineering analyses programs. This center provides, at a fraction of their original costs, computer programs developed not only by NASA, but also by other government agencies. A large percentage of these programs can be incorporated directly into existing commercial or educational operations with little or no modification. Over 1,600 programs are currently being carried by COSMIC with the potential for application to problems in pollution control, health care, law enforcement, energy, manufacturing, communications, construction, consumer products, transportation, agriculture and, of course, computer technology.

What I have talked about so far, relates basically to industrial applications specifically but more generally to the private sector of our economy. The public sector presents an entirely different set of problems, both technically and operationally. By "operationally" I mean the mode in which one operates to bring technology to bear on public oriented problems. For example, in most cases state and local municipalities, particularly the smaller cities and towns, have limited research and development organizations or facilities to experiment with technology. Even more important, few have the capability to match current needs with currently available technology. We at NASA recognized this latter deficiency as a primary target for our transfer activities and, therefore, we created applications teams. These teams,

located throughout the country, work with public sector agencies in public safety, transportation, urban construction, and biomedicine, defining significant public problems that might be solved by adopting aerospace technology. Now, the important difference between this program and the others I mentioned, is that in the private sector, the person with the problem--that is, the user--usually applies the technology to suit his own needs; while in the public sector, the technology must be reengineered or redesigned for a specific application before it can be turned over to the final user. Very often this process involves not only applications engineering, but development, evaluation and finally field testing the prototype hardware. The difference here is that in the private sector we pass on technology. In the public sector we pass on hardware that demonstrates the application of technology.

Basically, this is NASA's Technology Utilization Program, but I haven't talked about the value of the program. Every program can be **measured by a bottom line and we define our bottom line in one word - benefits!** What was the use to which the technology was put? Who did it benefit and how? I would like to show you a 12 minute film that describes some of these benefits. After the film I'd like to make some concluding comments.

(12 minute film - "Partners with Industry")

I hope this film has given you a better understanding of what we try to accomplish. You will remember that I said earlier we measure our progress and effectiveness by the benefits derived from the transfer of aerospace technology. One of our frustrations is that we don't always know how the technology we furnished to various people was actually used. Sometimes even the user doesn't connect our information with its ultimate use. But we do know that our efforts have paid off for improved inorganic paint to help protect coastal bridges from seawater corrosion; flat wire mounted on the outside of walls and **floors instead of in them; studless winter tires that remain pliable** in sub-zero degree weather; detection of bearing defects particularly in railroad wheel bearings ; waste heat recovery from furnace flues using pipes and a risk management system to help prevent catastrophic

fires in liquid natural gas plants.

Last year economists at Mathematical, Inc. , Princeton, New Jersey, selected four spinoffs from aerospace technology and estimated their return to our national economy. The benefits from these four areas alone--integrated circuits, gas turbines used for electric-power generation, a structural analysis program, and insulation for cryogenic uses--calculated into the 1980's, amounted to \$7 billion! We think this is a strong indication that applying technology to other than aerospace uses pays off and more importantly, pays off in the right places--the people who paid for the technology in the first place.

One last comment, we have felt for a long time that we could do much more in the field of manufacturing productivity and more specifically, the application of computer technology in this field. NASA and CAM-I have found an area where we believe our combined talents could be applied to our mutual benefit. This project, jointly supported by our two organizations, is our first step in this direction and if it proves successful, as we believe it will, we will then continue to explore other similar areas over a much broader field of applications so that we can convert our national investment in aerospace research and technology into spinoffs that improve your job, your health, your home, your environment, and your future.

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